

What is Claimed Is:

1. A kit for assaying hematopoiesis and hematotoxicity by luminescence output (HALO), said kit comprising a vessel or vessels containing a serum mix, a methyl cellulose mix, a growth factor mix, a medium, an ATP-releasing reagent, and an ATP luminescence-monitoring reagent.
2. The kit of Claim 2, further comprising a luminescence plate.
3. The kit of Claim 2, wherein the luminescence plate is a multi-well plate.
4. The kit of Claim 1, wherein the luminescence plate is non-sterilized and non-coated.
5. The kit of Claim 1, further comprising instructions for using the kit in a method to determine the proliferative state of a target cell population by luminescence output.
6. The kit of Claim 1, further comprising instructions for using the kit in a method to determine hematotoxicity by luminescence output.
7. The kit of Claim 5, wherein the method comprises:
 - obtaining a target cell population;
 - forming a master mix comprising the serum mix, the methyl cellulose mix, the growth factor mix and the target cell population;
 - distributing the master mix into the wells of a luminescent plate;
 - incubating the distributed master mix;
 - determining the intracellular ATP content of the target cell population of the incubated master mix by determining relative luminescent units;
 - and
 - correlating said relative luminescent units with the proliferative state of

the target cell population mix.

8. The kit of Claim 7, wherein the method further comprises:
adding ATP releasing reagent to the distributed master mix; and
adding ATP luminescence monitoring reagent to the distributed master
5 mix.
9. The kit of Claim 1, further comprising an ATP standard solution.
10. The kit of Claim 1, wherein the serum mix comprises bovine serum albumin,
an insulin, an iron-saturated transferrin, a serum and IMDM.
11. The kit of Claim 10, wherein the insulin is recombinant insulin.
- 10 12. The kit of Claim 1, wherein the growth factor mix comprises at least one
growth factor selected from the group consisting of erythropoietin,
granulocyte-macrophage colony stimulating factor, granulocyte colony
stimulating factor, macrophage colony stimulating factor, thrombopoietin,
stem cell factor, interleukin-1, interleukin-2, interleukin-3, interleukin-6,
15 interleukin-7, interleukin-15, Flt3L, and leukemia inhibitory factor, and
combinations thereof.
13. The kit of Claim 1, wherein the methyl cellulose mix has between about 1.5%
and about 2.5% methyl cellulose.
14. The kit of Claim 1, wherein the kit contains an amount of each reagent
20 adjusted for use in a plurality of luminescence plates.
15. The kit of Claim 5, wherein the target cell population comprises a population
of human or animal hematopoietic cells.

16. The kit of Claim 5, wherein the method comprises:
- obtaining a target cell population;
- incubating the target cell population in a cell growth medium comprising fetal bovine serum having a concentration of between 0% to about 30% by volume and methyl cellulose having a concentration of between about 0.4% to about 0.7%, by weight and in an atmosphere comprising between about 3.5% oxygen and about 7.5% oxygen;
- contacting the target cell population with the ATP-releasing reagent and the ATP luminescence-monitoring reagent; and
- determining the luminescence generated by the reagent contacting the cell population, wherein the level of luminescence correlates to the amount of ATP in the cell population, wherein the amount of ATP correlates to the proliferative status of the target cell population.
17. The kit of Claim 16, wherein the concentration of fetal bovine serum in the cell growth medium is between about 0% to about 10% by volume.
18. The kit of Claim 16, wherein the concentration of methyl cellulose in the cell growth medium is about 0.7% by weight.
19. The kit of Claim 16, wherein the concentration of oxygen in the atmosphere is about 5% by volume.
20. The kit of Claim 16, wherein the method further comprises contacting the target cell population with at least one cytokine.
21. The kit of Claim 20, wherein the method further comprises generating a target cell population enriched in hematopoietic stem cells.

22. The kit of Claim 20, wherein the method further comprises generating a cell suspension enriched in at least one hematopoietic progenitor cell lineage.
23. The kit of Claim 16, wherein the target cell population comprises hematopoietic stem cells.
24. The kit of Claim 16, wherein the target cell population comprises hematopoietic progenitor cells.
25. The kit of Claim 16, wherein the target cell population comprises hematopoietic stem cells and hematopoietic progenitor cells.
26. The kit of Claim 16, wherein the target cell population are primary hematopoietic cells.
27. The kit of Claim 26, wherein the primary hematopoietic cells are isolated from an animal tissue selected from the group consisting of peripheral blood, bone marrow, umbilical cord blood, yolk sac, fetal liver, and spleen.
28. The kit of Claim 27, wherein the animal tissue is obtained from a human.
29. The kit of Claim 28, wherein the animal tissue is obtained from a mammal.
30. The kit of Claim 29, wherein the mammal is selected from the group consisting of cow, sheep, pig, horse, goat, dog, cat, non-human primates, rodents, rabbit and hare.
31. The kit of Claim 29, wherein the animal tissue is selected from bone marrow, yolk sac, fetal liver, and spleen.

32. The kit of Claim 28, wherein the human tissue is further selected from the group consisting of peripheral blood, bone marrow, and umbilical cord blood.
- 5 33. The kit of Claim 26, wherein the primary hematopoietic stem cells are isolated from peripheral blood.
34. The kit of Claim 16, wherein the method further comprises selecting a differentially distinguishable subpopulation of primitive hematopoietic cells from the the target cell population, wherein the subpopulation of cells is defined by a cell surface marker thereon.
- 10 35. The kit of Claim 34, wherein selecting a differentially distinguishable subpopulation of target cells comprises:
contacting the target cell population with a cell surface marker indicator capable of selectively binding to a cell surface marker of a differentially distinguishable subpopulation of cells; and
15 selectively isolating the subpopulation of cells binding the indicator.
36. The kit of Claim 34, wherein the cell surface marker is selected from the group consisting of CD3, CD4, CD8, CD34, CD90 (Thy-1) antigen, CD117, CD38, CD56, CD61, CD41, glycophorin A, HLA-DR, and CD133.
- 20 37. The kit of Claim 34, wherein the cell surface marker is CD34⁺.
- 25 38. The kit of Claim 35, wherein the subpopulation of differentially distinguishable primitive cells is selectively isolated by magnetic bead separation.
39. The kit of Claim 35, wherein the differentially distinguishable subpopulation of primitive hematopoietic cells is selectively isolated by flow cytometry and
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cell sorting.

40. The kit of Claim 16, wherein the target cell population comprises a stem cell lineage selected from the group consisting of colony-forming cell-blast (CFC-blast), high proliferative potential colony forming cell (HPP-CFC) colony-forming unit-granulocyte, erythroid, macrophage, megakaryocyte (CFU-GEMM).
41. The kit of Claim 16, wherein the target cell population comprises a hematopoietic progenitor cell lineage selected from the group consisting of granulocyte-macrophage colony-forming cell (GM-CFC), megakaryocyte colony-forming cell (Mk-CFC), macrophage colony-forming cell (M-CFC), granulocyte colony forming cell (G-CFC), burst-forming unit erythroid (BFU-E), colony-forming unit-erythroid (CFU-E), colony-forming cell-basophil (CFC-Bas), colony-forming cell-eosinophil (CFC-Eo), B cell colony-forming cell (B-CFC) and T cell colony-forming cell (T-CFC).
42. The kit of Claim 16, wherein the reagent capable of generating luminescence in the presence of ATP comprises luciferin and luciferase.
43. The kit of Claim 20, wherein the at least one cytokine is selected from the group consisting of erythropoietin, granulocyte-macrophage colony stimulating factor, granulocyte colony stimulating factor, macrophage colony stimulating factor, thrombopoietin, stem cell factor, interleukin-1, interleukin-2, interleukin-3, interleukin-6, interleukin-7, interleukin-15, Flt3L, leukemia inhibitory factor, and combinations thereof.
44. The kit of Claim 20, wherein the at least one cytokine is selected from the group consisting of stem cell factor, interleukin-6 and Flt3L.

45. The kit of Claim 20, wherein the at least one cytokine is selected from the group consisting of macrophage colony stimulating factor, interleukin-1, interleukin-3, interleukin-6 and stem cell factor.
- 5 46. The kit of Claim 20, wherein the at least one cytokine is selected from the group consisting of erythropoietin, granulocyte-macrophage colony stimulating factor, granulocyte colony stimulating factor, stem cell factor, interleukin-3, interleukin-6, and Flt3L.
- 10 47. The kit of Claim 20, wherein the at least one cytokine is selected from the group consisting of erythropoietin, erythropoietin and interleukin-3, erythropoietin and stem cell factor and erythropoietin, stem cell factor and interleukin-3.
- 15 48. The kit of Claim 20, wherein the at least one cytokine is selected from the group consisting of granulocyte-macrophage colony stimulating factor, granulocyte-macrophage colony stimulating factor and interleukin-3, and granulocyte-macrophage colony stimulating factor, interleukin-3 and stem cell factor.
- 20 49. The kit of Claim 20, wherein the at least one cytokine is selected from the group consisting of the groups consisting of thrombopoietin, and thrombopoietin, interleukin-3 and interleukin-6.
- 25 50. The kit of Claim 20, wherein the at least one cytokine is selected from the group consisting of interleukin-2, and interleukin-7, Flt3L and interleukin-15.
51. The kit of Claim 20, wherein the at least one cytokine is selected from the group consisting of interleukin-7, and interleukin-7 and Flt3L.
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52. The kit of Claim 20, wherein the at least one cytokine is erythropoietin.
53. The kit of Claim 20, wherein the at least one cytokine is selected from the group consisting of granulocyte-colony stimulating factor and granulocyte-macrophage colony stimulating factor.
54. The kit of Claim 20, wherein the at least one cytokine is selected from the group consisting of interleukin-3, and interleukin-3 and stem cell factor.
55. The kit of Claim 20, wherein the cytokine is granulocyte-macrophage colony stimulating factor, interleukin-3 and interleukin-5.
56. The kit of Claim 20, wherein the at least one cytokine is selected from the group consisting of macrophage colony stimulating factor, macrophage colony stimulating factor and granulocyte-macrophage colony stimulating factor, and granulocyte-macrophage colony stimulating factor.
57. The kit of Claim 5, wherein the method further comprises identifying a population of primitive hematopoietic cells having a proliferative status suitable for transplantation into a recipient patient.
58. The kit of Claim 5, wherein the method further comprises:
contacting the target cell population with a test compound; and
determining the ability of the test compound to modulate the proliferation, and optionally differentiation, of the target cell population.
59. The kit of Claim 5, wherein the method further comprises:
determining the ability of the test compound to modulate the differentiation, of the target cell population.

60. The kit of Claim 16, wherein the target cell population comprises a plurality of target cell populations, and wherein the method further comprises:
- 5 contacting the plurality of target cell populations with a compound;
 and
 determining the ability of the a test compound to alter the proliferation of the target cell population by comparing the proliferative status of the plurality of target cell populations with the proliferative status of a target population of primitive hematopoietic cells not in contact with
10 the test compound; and
 identifying the at least one test compound modulating the proliferative status of the target cell population.
61. The kit of Claim 5, wherein the method is a high-throughput assay method for
15 rapidly identifying a compound capable of modulating the proliferative status of a target cell population, comprising:
- obtaining a target cell population;
 dividing the target cell population into a first target cell population and a second target cell population;
20 incubating the first target cell population in a cell growth medium comprising a concentration of fetal bovine serum between about 0% to about 30% by weight and methyl cellulose between about 0.4% to about 0.7% by weight, and in an atmosphere having between about 3.5% oxygen to about 7.5% oxygen by volume;
25 providing a second target cell population comprising primitive hematopoietic cells;
 contacting the first and second target cell population with at least one cytokine selected from the group consisting of erythropoietin, granulocyte-macrophage colony stimulating factor, granulocyte colony
30 stimulating factor, macrophage colony stimulating factor,

thrombopoietin, stem cell factor, interleukin-1, interleukin-2, interleukin-3, interleukin-6, interleukin-7, interleukin-15, Flt3L, leukemia inhibitory factor, insulin-like growth factor, and insulin; contacting the first target cell populations with at least one test compound;
5 contacting the first and second target cell populations with the ATP-releasing reagent and the ATP luminescence-monitoring reagent; detecting the level of luminescence generated by the ATP luminescence-monitoring reagent, the level of luminescence indicating the proliferative status of the first and second target cell populations;
10 and comparing the proliferative status of the first target cell population with the proliferative status of the second target population of primitive hematopoietic cells, thereby identifying a test compound capable of modulating the proliferative status of a target cell population.
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62. The kit of Claim 61, wherein contacting the first and second target cell populations with at least one cytokine generates target cell populations enriched in hematopoietic stem cells.
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63. The kit of Claim 62, wherein the hematopoietic stem cells are selected from the group consisting of colony-forming cell-blast (CFC-blast), high proliferative potential colony forming cell (HPP-CFC) colony-forming unit-granulocyte, erythroid, macrophage, megakaryocyte (CFU-GEMM).
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64. The kit of Claim 61, wherein contacting the first and second target cell populations with at least one cytokine generates target cell populations enriched in at least one hematopoietic progenitor cell lineage.

30 65. The kit of Claim 64, wherein the hematopoietic progenitor cell lineage is

- 5 selected from the group consisting of granulocyte–macrophage colony-forming cell (GM-CFC), megakaryocyte colony-forming cell (Mk-CFC), macrophage colony-forming cell (M-CFC), granulocyte colony forming cell (G-CFC), burst-forming unit erythroid (BFU-E), colony-forming unit-erythroid (CFU-E), colony-forming cell-basophil (CFC-Bas), colony-forming
66. The kit of Claim 61, wherein the method further comprises:
contacting the first target cell population with at least two
concentrations of a test compound; and
10 calculating the IC50 of the test compound.
67. The kit of Claim 61, wherein the method further comprises calculating the IC90 of the test compound.
- 15 68. A kit for assaying hematopoiesis and hematotoxicity by luminescence output (HALO method), said kit comprising a vessel or vessels containing a serum mix, a methyl cellulose mix, a growth factor mix, a medium, an ATP-releasing reagent, an ATP luminescence-monitoring reagent; a luminescence plate and instructions for using the kit in a method to determine the proliferative state of
20 a target cell population by the HALO method.